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ABSTRACT

A survey of the extent of the dissemination of the Curriculum and Evaluation Standards of the National Council of Teachers of Mathematics (NCTM) within the Capital District area of New York State revealed that 61% of the 381 respondents, from a contacted sample of 726 teachers, were aware of the Standards. Among the findings was one showing that there was no significant difference in the level of this awareness between teachers at public and private institutions; however, proportionally fewer teachers in rural areas were informed about the Standards than teachers in either suburban or urban areas. Further, significantly fewer elementary teachers than secondary teachers were cognizant of the Standards. The most commonly reported effective modes for dissemination of information concerning the Standards were departmental meetings and membership in the NCTM. Overall, most teachers who had heard of the Standards had read them completely or in part and had found them to be understandable as well as practical, to the extent that 52% of these teachers felt the Standards had changed their teaching at least somewhat, whereas 27% reported no change in their teaching methods. The majority of respondents described the current state of mathematics education as being problematic. Finally, over half of the respondents had used computers, calculators, and cooperative learning techniques within their classrooms. (JJK)

Dissemination of The National Council of Teachers of Mathematics' Curriculum and Evaluation Standards In the Capital District Area of New York State

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ABSTRACT

A survey of the extent of the dissemination of the National Council of Teachers of Mathematics' Curriculum and Evaluation Standards in the Capital District area of New York state revealed that 61% out of the 381 (out of 726) respondents had heard of the Standards. There was no difference in level of awareness of the Standards between public and private institutions; however, proportionally fewer teachers in rural areas than in suburban or urban areas had heard of the Standards. Proportionally fewer elementary teachers than secondary teachers had heard of the Standards. The most commonly reported effective modes for dissemination of information about the Standards were departmental meetings and membership in the National Council of Teachers of Mathematics. Most teachers who had heard of the Standards had read it in part or completely and found it to be readable and practical. Of those teachers who had heard of the Standards, 52% felt it had changed their teaching somewhat, while 27% reported no change at all in their teaching. The majority of the respondents found the state of mathematics education today was problematic. Finally, over half the respondents used computers, calculators and cooperative learning approaches in their classrooms.

BACKGROUND OF CURRICULAR CHANGE IN MATHEMATICS EDUCATION

In March of 1989, the National Council of Teachers of Mathematics' (NCTM) introduced the NCTM Curriculum and Evaluation Standards (Standards), calling for many improvements and changes in mathematics education. But as with all calls for innovation in mathematics education the question arises: will the Standards have any impact, or similar to many other proposals and agendas will it have relatively little or delayed impact?

This is a broad question and the definition of impact, let alone the isolation of variables necessary to measure impact is not readily identifiable. The purpose of this study was to explore this question by first attempting to measure the extent of dissemination of the materials, since this has been implicated in the apparent failures of past revolutionary attempts (Cooney, 1988). Also, NCTM has recognized this as a possible impediment and a variable to target. The Standards were available in published form in March 1989 and earlier in draft format. Tom Romberg informed us that in addition to the 200,000 copies of the Standards distributed to NCTM members, the

Standards were translated into seven languages. School officials and every school district in the United States received an overview of the Standards. We chose to look at the extent of dissemination among teachers (all mathematics teachers at the secondary level and a portion of elementary school teachers) in the Capital District area around Albany, New York.

HISTORY & RESEARCH

A brief overview of the history of significant attempts to impact mathematics education may clarify the role of dissemination in curricular change. Since at least 1892, almost 100 years ago, there have been repeated attempts by national organizations to improve the learning of mathematics by revolutionizing or sometimes in smaller ways, affecting the teaching, curriculum and evaluation of mathematics, (NCTM 1970; James & Clason, 1970).

In 1892, the National Education Association "Committee of Ten" proposed revisions in mathematics education such as: use concrete problems, show the utility of mathematics, decrease recitation, and allow students to tailor their high school years depending on their career goals. The International Commission on the Teaching of Mathematics report of 1911 called for the use of labs and models for illustrations and the integration of mathematics and science. In 1920, "The Problem of Mathematics in Secondary Education" report urged that all high school students should not be required to take the same mathematics course. The "1923 Report" by the Mathematical Association of America called for an emphasis on connections with other subjects and real life applications. In 1980 the "Agenda for Action" was put forth by NCTM; it highlighted the need for a greater emphasis on problem solving and more effective and efficient teaching (NCTM, 1980).

Some reports and proposals indeed had effects on mathematics education, yet many others did not (Cooney, 1988; Farrell & Farmer, 1988). Many original proposals never took hold, why is that? Many of the proposals in the Standards appeared in earlier reports, but were not implemented. One conjecture for the failure of earlier reports to affect change, has been the lack of adequate dissemination to teachers. Thus an important component of NCTM's work with the Standards is the appointment of a committee on implementations.

According to Judith Threadgill Sowder* , there have been state-level informational meetings and in-service efforts related to the Standards. Albany, New York had its in-service training in March of 1990. There have also been several national, district and state conferences, as well as several journal articles, that focused on the Standards. After such a concerted initial effort it seemed that within a specific geographical area we could get a measure of the success of the dissemination efforts. We consider this an important question for researchers, educators and administrators alike since many dollars and hours have been expended in the last century for the purpose of improving mathematics education.

METHODS

The four-county (Albany, Schenectady, Renssalaer and Saratoga) area around the city of Albany, the capital of New York state, was selected as the population to be sampled. The New York State Education Department provided the labels for all the mathematics teachers (which included elementary school teachers also listed under mathematics) in the public schools from that population. We were able to utilize the entire population (n=650) of public secondary and elementary school mathematics teachers. In order to include the private and parochial schools the yellow pages were referred to. Each school was called and the secondary mathematics and three elementary teachers' names obtained (n=76). (There was no private school listing available through New York State Education and the listing available through the local teacher's union (New York State United Teachers) was biased accordingly).

Our main variables were: familiarity with the Standards, influence of the Standards on their teaching, use of technology, and demographic background of respondents. The measurement instrument was a survey (piloted), see Figure 1, printed on a pre-stamped, pre-addressed postcard, mailed (with a brief letter of explanation) to each teacher identified to be teaching mathematics in the four-county area as well as a portion of the elementary school teachers.

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* telephone conversation

Figure 1. Survey

This survey is very brief and is an effort to estimate the extent to which the Curriculum and Evaluation Standards for School Mathematics (prepared by the National Council of Teachers of Mathematics NCTM) have been disseminated

Previous to this survey, had you heard of the Standards? *yes* ☐ *no* ☐

If yes, where? *received a copy of the Standards as a member of NCTM* ☐
in a journal ☐
from a colleague ☐
department meeting ☐
other _____ ☐

Have you read the Standards ? *not at all* ☐
skimmed ☐
read it in part ☐
read it completely ☐

If you have read the Standards in part or completely, did you find it easy to read? *yes* ☐ *mostly* ☐ *not really* ☐ *no* ☐

did you find the examples and applications were practical? *yes* ☐ *mostly* ☐ *not really* ☐ *no* ☐

do you feel the Standards have changed your teaching? *greatly* ☐ *somewhat* ☐ *not at all* ☐

In your teaching methods, do you utilize:
calculators: *often* ☐ *occasionally* ☐ *never* ☐
computers: *often* ☐ *occasionally* ☐ *never* ☐
cooperative learning methods: *often* ☐ *occasionally* ☐ *never* ☐

What stage do you think mathematics education is in today? *crisis* ☐ *mostly problematic* ☐ *mostly successful* ☐

Are you aware of any special in-service programs about the Standards planned for your school? *yes* ☐ *no* ☐

What grades do you teach?
K ☐ *1* ☐ *2* ☐ *3* ☐ *4* ☐ *5* ☐ *6* ☐ *7* ☐ *8* ☐ *9* ☐ *10* ☐ *11* ☐ *12* ☐

What level mathematics? *below level* ☐ *average grade level* ☐ *above average* ☐

Type of school? *public* ☐ *private* ☐ *parochial* ☐

What is your sex ? *male* ☐ *female* ☐

Describe your school location: *rural* ☐ *suburban* ☐ *urban* ☐ *inner city* ☐

THANK YOU FOR YOUR TIME!

RESULTS AND DISCUSSION

Of the 726 surveys mailed to public and private, primary and secondary educators, 381 surveys were returned. Only one was not useable. The return rate was 52% overall. The return rate for public schools was 53% and 46% for private schools. Table 1 summarizes the demographic data on the respondents. There was a representative proportion of males and females in the returned surveys. The return rate of teachers in public and private schools was representative of the population to whom the surveys were sent. The return rate for school environmental location matches the general profile of the area, however further investigation is being done to verify this.

Table 1. Demographic Summary of Respondents

Variable	Percentage
Gender	
Males	41%
Females	58%
Not reported	1%
School Type	
Public	90%
Private/Parochial	9%
Not reported	1%
School Environmental Location	
Rural	15%
Suburban	51%
Urban	33%
Not reported	1%

Follow up surveys were not able to be mailed due to unexpected cuts in funding. Efforts are being made presently to estimate the percentage of non-respondents who had heard of the Standards.

If the respondents in this survey are representative of the population at large, then a remarkable 61% of teachers have heard of the Standards within one and a half years of the beginning of the dissemination process. In the worst case scenario, where all non-respondents (n=345) had not heard of the Standards, a minimum of 32% would have neard of the Standards within one and a half years of the beginning of the dissemination process, still a relatively large proportion of the population.

As can be seen in Figure 2, the two most commonly reported modes of dissemination were the department meeting (23% of those who had heard of the Standards heard this way) and by being a member of NCTM (also 23%). Unfortunately, only 10% of all teachers were aware of any inservice education programs planned for their school, this may be due to the relatively small proportion of schools that receive inservice training programs.

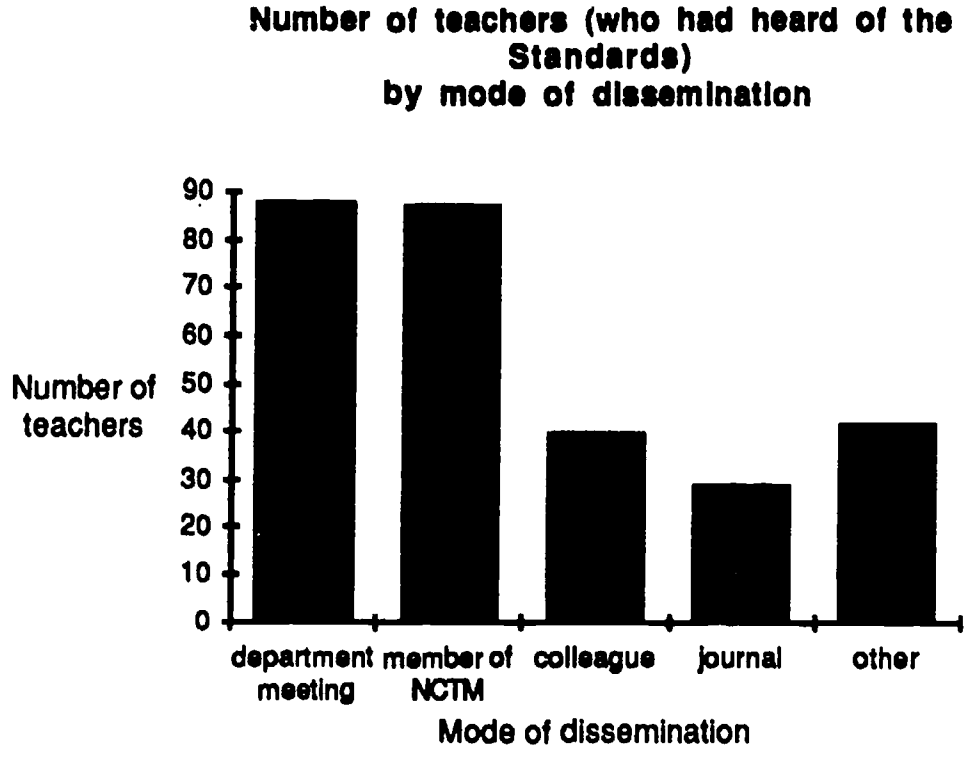


Figure 2

Figure 3 reveals that most teachers who had heard of the Standards had either read it in part or read it completely (65% of the teachers), and most who had read the Standards in part or completely found it easy to read (88%) and found the examples and applications practical or mostly practical (81%), see Figure 4. Most who had read the Standards felt that it had changed their teaching somewhat (51%), with more feeling it had not changed their teaching at all (25%) than felt it had changed their teaching greatly (2%); 22% gave no response, see Figure 5.

At first glance, Figure 6 appears to indicate that more teachers of grades 6-12 responded than teachers of other grades. However, teachers at the secondary level often teach more than one grade level and are therefore represented in several categories. In addition, only a portion of the elementary teachers were sampled. Thus the respondents are fairly evenly distributed across grade levels.

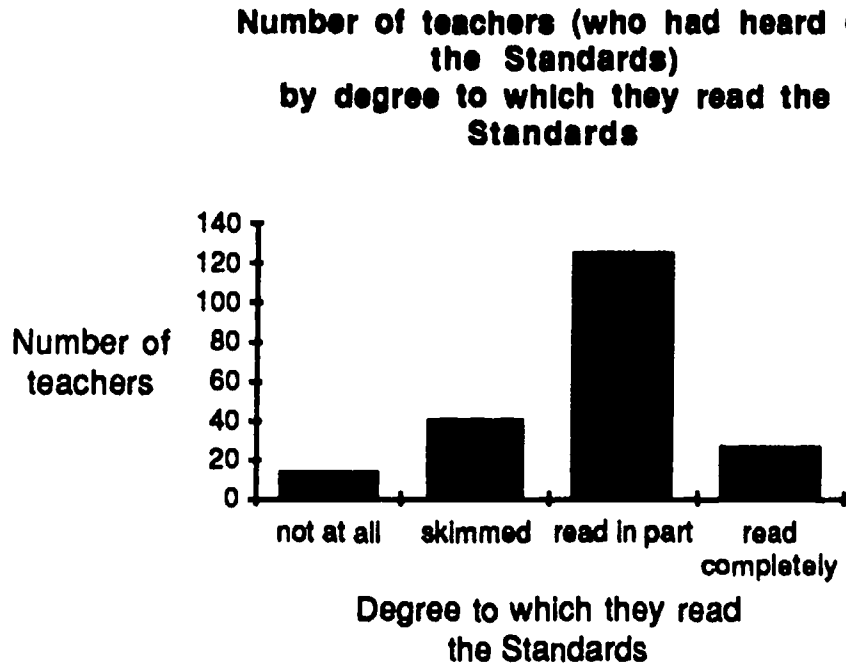
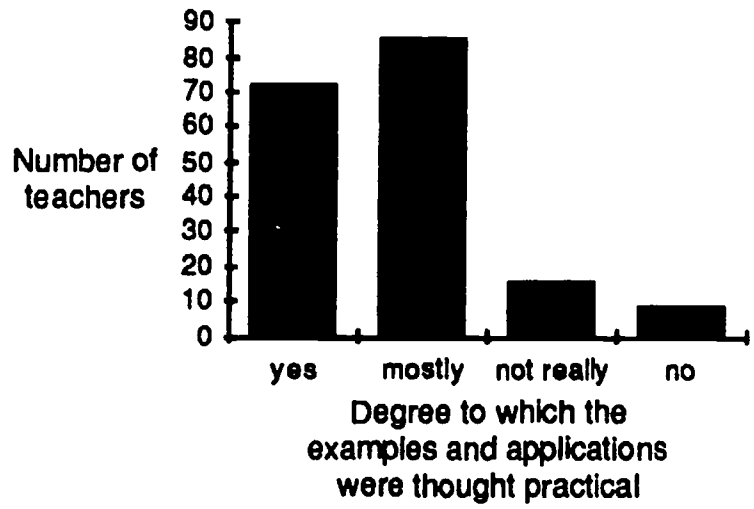


Figure 3



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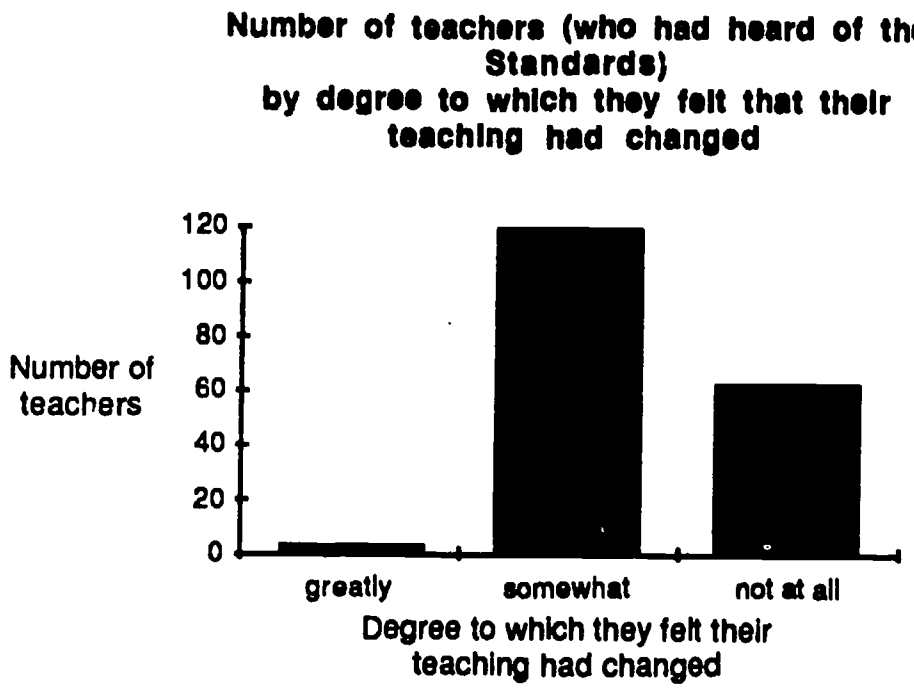

Figure 5

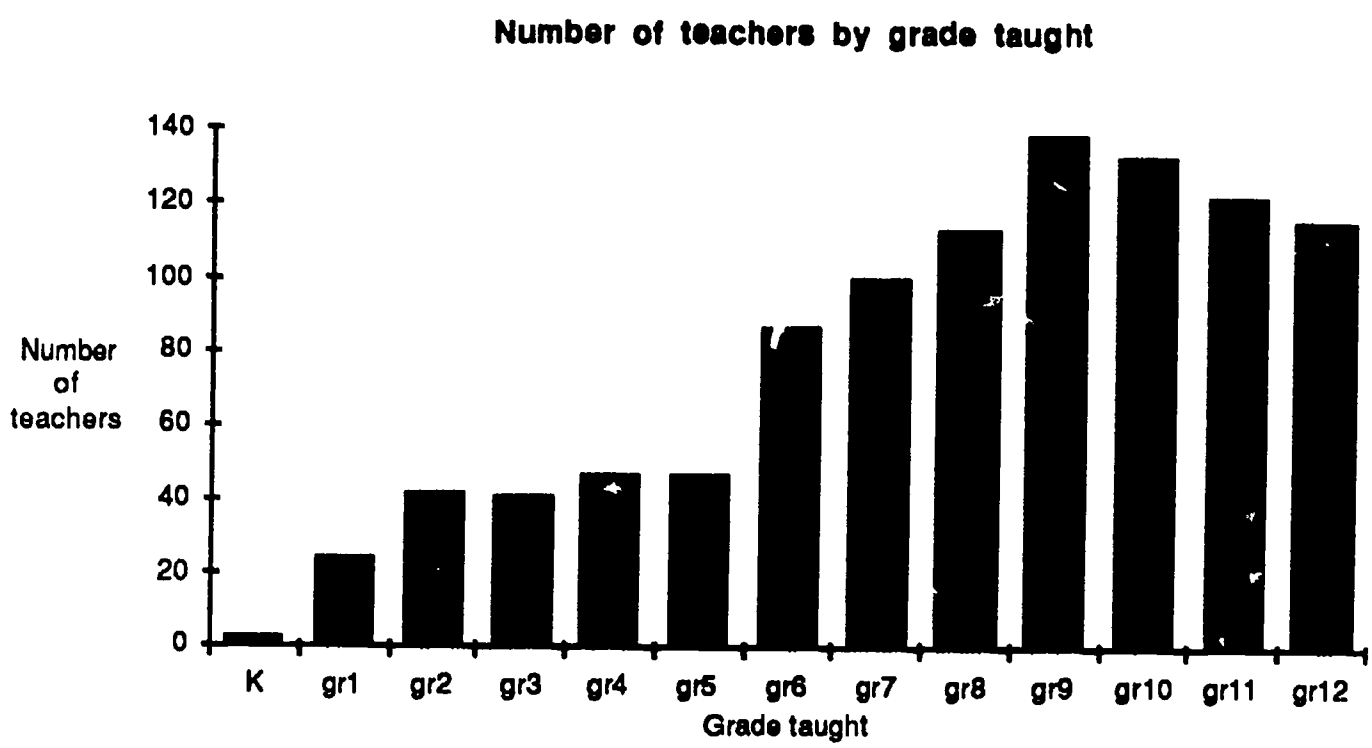

Figure 6

Of general interest is the question: since teachers have power to affect change, how do they view the state of mathematics education today? Our survey revealed that most felt it was largely problematic (58%) while

approximately the same percentages felt more optimistic or pessimistic (22% and 20% respectively), see Figure 7. With large educational budget cuts recently issued nationwide the opinions may have become more pessimistic. A significant influence at the time of the survey was the increasing awareness that the success of our nation's economy is related to the success of our educational programs. In particular our ability to compete with Japan has perhaps become limited as our teachers have a more difficult task in teaching mathematics and sciences due to the way our educational system is set up (Cooney, 1988).

Additionally of general interest is the degree to which teachers use modern technology and varied teaching methods in the classroom. Figure 5 shows that a majority of teachers reported occasional use of calculators (59%), computers (54%) and cooperative learning techniques (58%) in the classroom, while some teachers reported using these tools and techniques often (18%, 17%, 23% respectively). Some teachers reported never using these tool and techniques 19%, 23% and 12% respectively). The percentage for computer use is comparable to the National Assessment of Educational Progress (NAEP) trends in the percentage of 13-year-olds (47%) and 17-year-olds (57%) reporting access to computers for learning mathematics (Dossey, Mullis, Lindquist & Chambers, 1988). The percentage of teachers in our sample who reportedly used calculators is considerably higher than the 15% to 26% reported use by Grade 3, Grade 7 and Grade 11 students in the NAEP data (Dossey, Mullis, Lindquist & Chambers, 1988). This may indicate that our sample is somewhat better informed or somewhat more flexible in making instructional changes than the population of teachers at large. This difference could also be the result of societal pressure to support these ideas in self-report data. On the other hand, our data may indicate there has been an increased use of calculators in mathematics in schools since 1986. The 1990 and 1992 NAEP data may clarify this difference. Also, the use of small-group work by teachers in our sample is somewhat higher than that reported by students in the NAEP data: 58% in our sample compared to 47% for Grade 3, 35% for Grade 7 and 41% for Grade 12 students in the NAEP reports (Dossey, Mullis, Lindquist & Chambers, 1988).

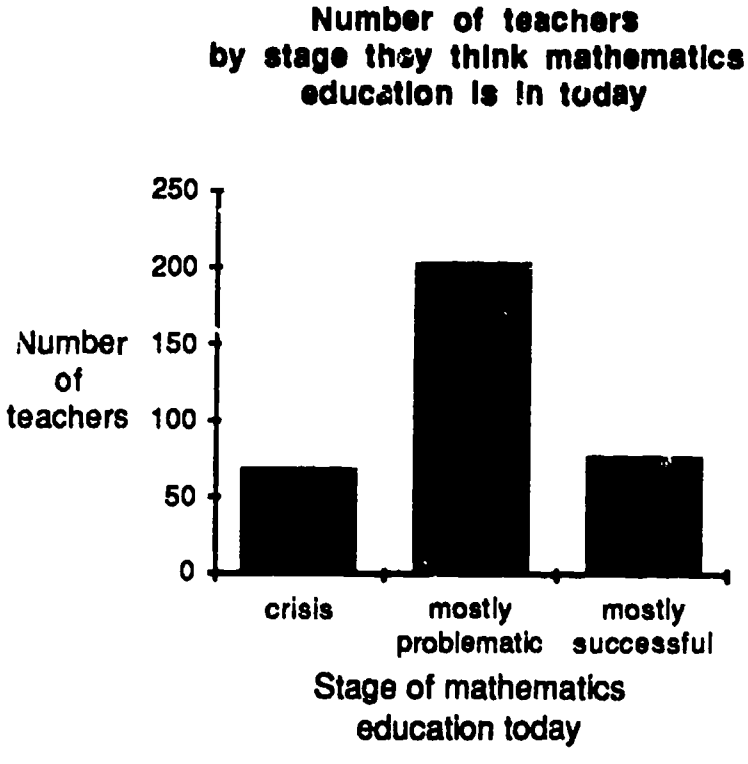

Figure 7

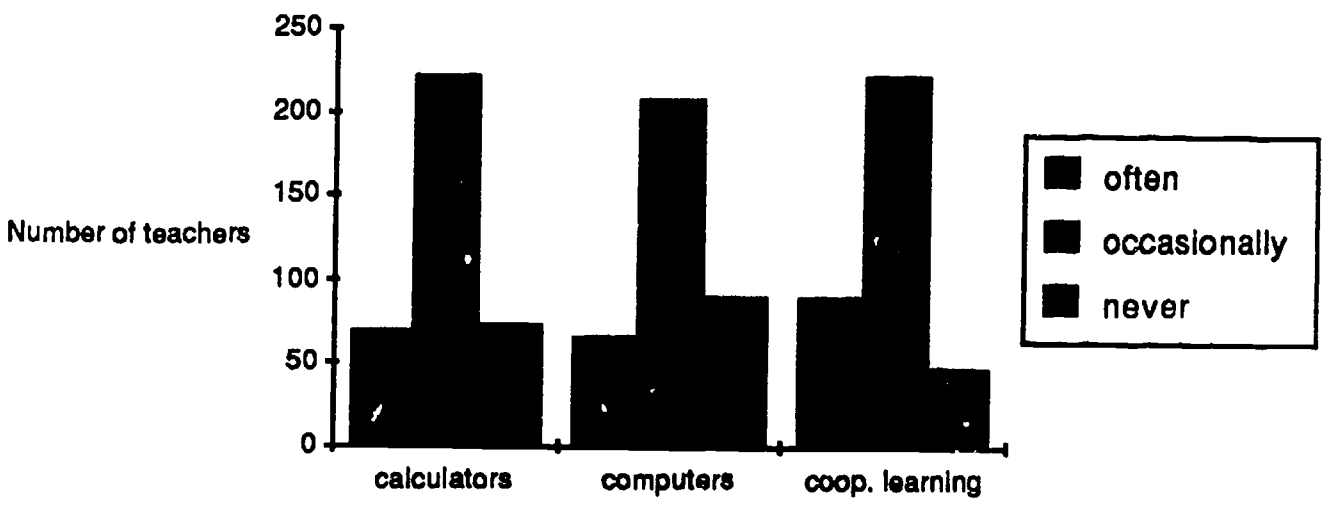

Figure 8

Chi Square values were calculated to check for possible relationships between whether a teacher had heard of the Standards and such variables as: school environmental location, sex of the teacher, teacher's view of the state of

mathematics education, type of school (public or private) and level of teaching (elementary/junior high school/senior high school). Significant relationships ($p<.001$) were found for level of teaching and school environmental location. Elementary school teachers were least likely to report having heard about the Standards while junior high school teachers were the most likely to report having heard about the Standards. Fewer teachers in rural schools had heard of the Standards than not, while many more teachers in suburban schools had heard of the Standards than not, and approximately equal numbers of teachers in urban school had heard of the Standards as had not. These results indicate that in planning for effective dissemination, extra effort may be needed for informing teachers in rural or urban schools and elementary schools. Interestingly, there was no significant relationship indicated between whether a teacher had heard of the Standards and the type of school they taught at (public vs. private).

IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Dissemination efforts need to be extended to all mathematics teachers in all schools, with an emphasis on rural and elementary schools. Cost effective means of delivering inservice education need to be explored so that more than 10% of the teachers have access to information needed to implement the Standards. Due to the self-report nature of this survey, the proportions of teachers reporting familiarity with and resulting change from reading the Standards (among other variables) may be inflated as a result of perceived societal desirability for such responses. Observational research in the classroom is desirable for determining the observable (vs. self-reported) effect of the Standards on teachers who have read it. Also, observational research in the classrooms may help to identify the most effective ways for individual teachers and districts to evaluate and implement the Standards. Lastly, because departmental meetings appear to be an effective means of disseminating information, networking at the departmental level across districts may be an advantageous means for sharing successful implementation plans and programs among schools.

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